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Taxonomic notes on some African species in the family Calymperaceae (Musci)

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SYNOPSIS. *Syrrhopodon usambaricus* Broth. ex S. Orbán is placed in synonymy with *Syrrhopodon asper* Mitt., and *Syrrhopodon lisowskii* S. Orbán in synonymy with *Syrrhopodon gardneri* (Hook.) Schwägr. The distinctive features of *Syrrhopodon stuhlmannii* Broth. are discussed, and the only records of *Calymperes moluccense* Schwägr. from Africa are redetermined as *Calymperes palisotii* Schwägr.

The research for this paper was largely undertaken in response to difficulties encountered in identifying the specimens of *Syrrhopodon* collected during the British Bryological Society Expedition to Mulanje Mountain, Malawi, 1991. Determination of this material would have been considerably more difficult without the important primary accounts of the African species of *Syrrhopodon* by Orbán (1981) and Orbán & Reese (1986).

Syrrhopodon asper Mitt. in *J. Linn. Soc. Bot.* **7**: 151: 1863. Type: Tanzania, Kilimanjaro, *Hannington* s.n. (NY!-holotype, BM!-isotype).
Fig. 1.

Syrrhopodon usambaricus Broth. ex S. Orbán in *Acta Bot. Hung.* **24**: 113 (1978), syn. nov. Type: Tanzania, Usambara, Lutindi, 1902, *Liebusch* s.n. (H-BR!-holotype).

DISCUSSION. The leaves in *Syrrhopodon asper* Mitt. consist of a linear-lanceolate chlorophyllose limb extending from a subelliptical hyaline base. They possess a prominent marginal rib and are spinulose to various degrees. As in many species of *Calymperes* and *Syrrhopodon*, the leaves in different specimens can vary widely in their relative dimensions (Fig. 1a–c), and range from a stubby 4 mm to a slender 7.5 mm long. The marginal ribs, viewed in cross-section, are well differentiated. Commonly, a superficial layer of chlorophyllose cells encloses small dorsal and ventral groups of stereids that are separated by a median row of guide cells (a costa-like arrangement of tissues). This arrangement of cells in the marginal rib is plainly developed in the leaves of some specimens and less well developed in others (Fig. 1e–h). Towards the base in all leaves, the marginal rib becomes a flattened, undifferentiated, often unistratose band of linear cells. The region in the leaf base in which the margin transforms from a differentiated rib to an undifferentiated band also varies between specimens.

The type specimen of *Syrrhopodon usambaricus* Broth. ex S. Orbán (*Liebusch* s.n., H-BR) represents a form of *S. asper* Mitt. with tall, slender shoots. The leaves are relatively fine and narrow, and hardly curl when dry. The marginal ribs are well differentiated, and in the leaf base, the transition from polystratose rib to undifferentiated band occurs well below the apex of the hyaline lamina (Fig. 1i). In the isotype material of *S. asper* (*Hannington* s.n., BM) the shoots are small and have shorter, stubbier leaves. These curl when dry, are notably spinulose, and have prominent, well-differentiated marginal ribs. The region along the leaf at which the margin transforms from differentiated polystratose rib to unistratose/bistratose band tends to be adjacent to the apex of the hyaline lamina (Fig 1k).

Intermediate expressions of these contrasting features of *Hannington* s.n. and *Liebusch* s.n. are apparent in the great range of material now available for examination, and indicate that these superficially distinct type specimens represent extreme forms of the same species. For example, *Wood* 1726 (Tanzania, BM, BM-K) has leaves proportioned like those of the type of *Syrrhopodon asper* that become curled when dry, but some cross-sections through the distal hyaline leaf base show a degree of differentiation closer to that in the type of *S. usambaricus* (Fig. 1j).

SPECIMENS EXAMINED. **Malawi**. Mulanje Mountain, June 1991: *Hodgetts* 2041a, 2047c, 2220b, 2532a, 2669a (RNG!); *Kathumba* M5915a (RNG!), M5916 (BM!); *Kungu* M3123a (RNG!); *Longton* M8054a, M8058a, 8425b (RNG!); *Magombo* M4041b, 4042b (RNG!); *Porley* 35a, 278a (RNG!); *Russell* M6055b, M6063a, M6068a (RNG!); *Wigginton* M1034a, M1682a (RNG!), M1201a (BM!). **Uganda.** Kadese, Ruwenzori Mts, above Miniba camp, 2700 m, 22 January 1962, *Loveridge* JPL397 (BM!). **Kenya.** Mutha Hill, August 1938, *Boy Joana* 7519 (BM!, BM-K!). **Tanzania**. Usambara, Lutindi, 1911, *Liebusch* s.n. (H-BR!); Usambara Ouset, crête Matundsi-Mashindei, SE of Ambangudu Tea Estate, 1300 m, 5 February 1985, *Pócs* 8533/R (BM!); Kilimanjaro: above Marangu, 2000 m, 13 July 1948, *Hedberg* 1144e (BM-K!); on path between Marangu and Bismark Hut, 2400 m, 24 February 1953, *Wood* 1726 (BM!, BM-K!). Morogoro District: Nguru Mts, ridge behind Dikurura Valley, 1700–1900 m, 6°02'S 37°32'E, *Pócs* 89119/W (BM!); Nguru ya Ndege Hill NNW of Morogoro town, summit, 1200-1350 m, 6° 42'S 37° 36'E, *Pócs & Knox* 88252/H (BM!). **Mozambique.** Namúli, Makua Country, 1887, *Last* s.n. (BM-K!).

Syrrhopodon stuhlmannii Broth. *Bot. Jahrb. Syst.* **24**: 240 (1897). Type. Tanzania, Uluguru, Bergwald, 1600 m, *Stuhlmann* 8809 (BM!-isotype).
Fig. 2a–d.

DISCUSSION. In Orbán & Reese (1986) *Syrrhopodon usambaricus* Broth. ex S. Orbán [=*Syrrhopodon asper* Mitt.] is keyed out beside *S. stuhlmannii* Broth. Large specimens of *S. asper* are superficially similar to those of *S. stuhlmannii*. Both species possess leaves with marginal ribs that have a costa-like structure (viewed in cross-section). However, the species are easily distinguished. In leaves of *S. stuhlmannii* the marginal ribs are mostly smooth; the cells of the chlorophyllose lamina are ventrally roundly protuberant, and dorsally flat to barely protuberant (Fig. 2a–d). The rib at the margin of the distal hyaline lamina is very well developed and strongly differentiated, with a median row of guide cells often more than nine cells wide (Fig. 2c, d). In contrast, most superficial cells of the marginal

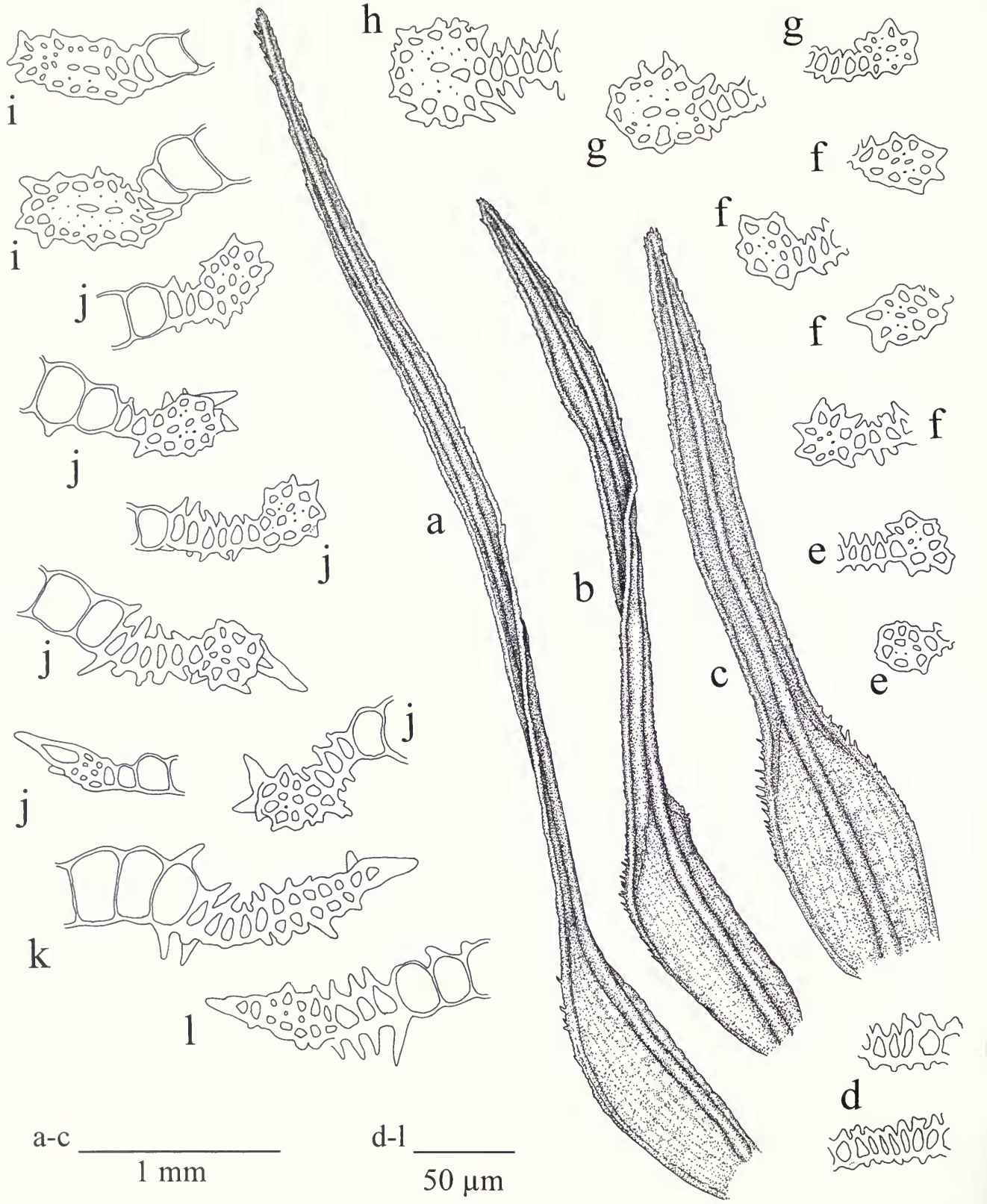

Fig. 1 a–l. *Syrrhopodon asper* Mitt. a–c: leaves; d–l: cross-sections of leaf through (d: chlorophyllose lamina, e–h: margin of chlorophyllose lamina, i–l: margin around distal hyaline lamina. a Drawn from *Pócs* 8533R (BM). b Drawn from *Pócs & Knox* 88252/H (BM), c Drawn from *Boy Joana* 7519 (BM). d, g, i, Drawn from *Liebusch* s.n. (H-BR, holotype of *Syrrhopodon usambaricus*). e, j Drawn from *Wood* 1726 (BM). f, k Drawn from *Hannington* s.n. (BM, isotype of *Syrrhopodon asper*). h, l Drawn from *Pócs* 89119/W (BM).

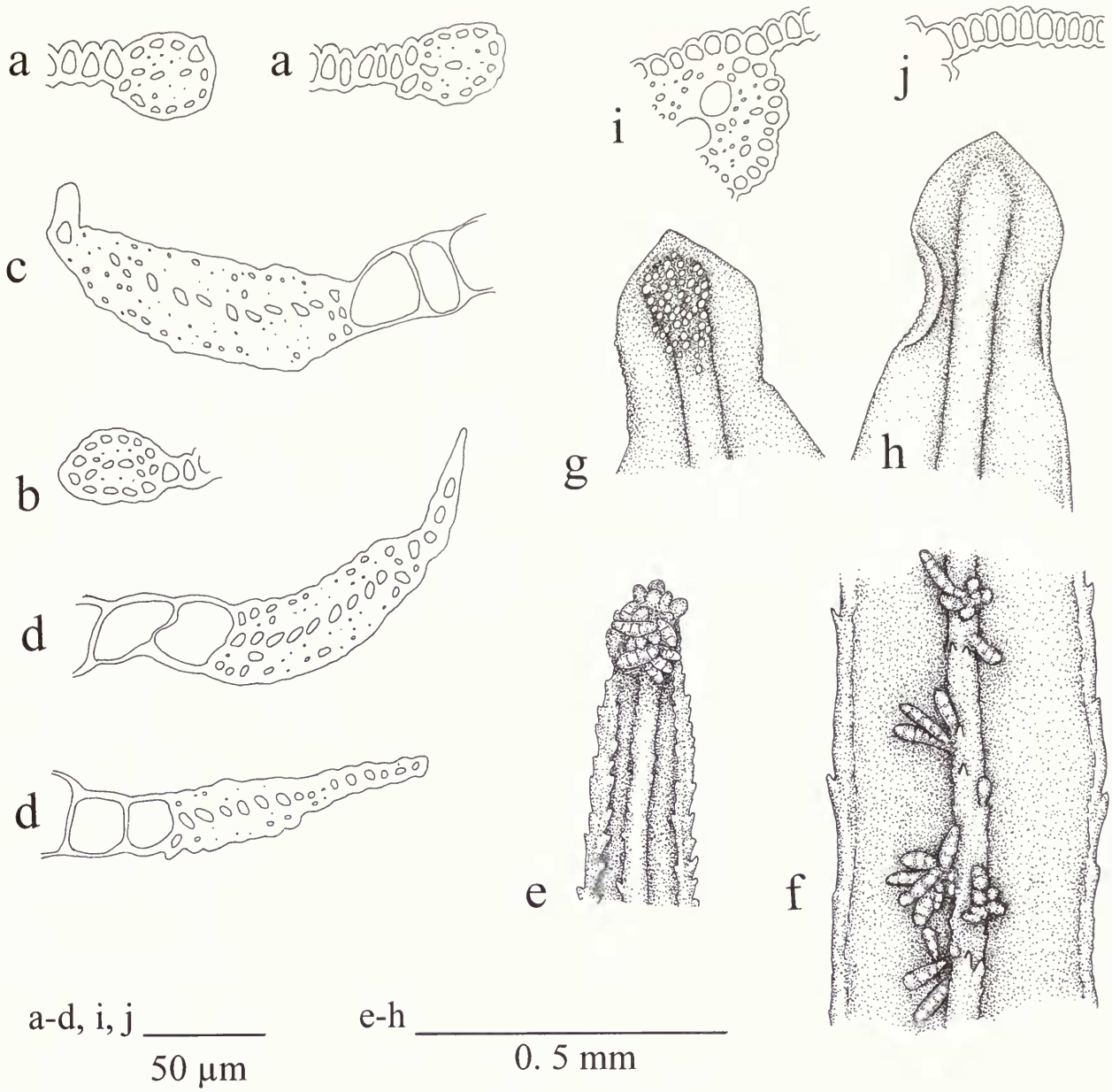

Fig. 2 a–d. *Syrrhopodon stuhlmannii* Broth. a–d: cross-sections through leaf margins (a, b: in chlorophyllose limb, c, d: in distal hyaline base). e, f: *Syrrhopodon gardneri* (Hook.) Schwägr. e, f: gemmae on leaves (e: in cluster at apex (ventral surface), f: in groups in mid-leaf). g–j. *Calymperes palisotii* Schwägr. g, h: apices of gemmiferous leaves (g: in ventral view showing gemmae-producing region (gemmae lost), h: in dorsal view); i, j: cross-sections of chlorophyllose limb (i: showing half of costa, and j: lamina). a, c Drawn from *Pócs & Knox* 89053/AK (BM). b, d Drawn from *Stuhlmann* 8809 (BM, isotype of *Syrrhopodon stuhlmannii*). e Drawn from *Kathumba* M5073b (RNG). f Drawn from *Longton* M8375a (RNG). g, h, i, j Drawn from *Lisowski* 50255 (EGR).

ribs and the cells of the chlorophyllose lamina in *S. asper* are replete with acute projections (Fig 1d–l). If apparent at all, the median row of guide cells in the rib at the margin of the distal hyaline lamina is usually less than six cells wide (Fig. 1i–l).

Syrrhopodon stuhlmanni Broth. remains a distinct species, apparently endemic to Tanzania.

SPECIMENS EXAMINED. **Tanzania**. Uluguru, Bergwald, 1600 m, *Stuhlmann* 8809 (BM!-isotype of *S. stuhlmannii*). Uluguru Mountains, 30 July 1941, *Eccles* AH8648 (BM!), AH8652 (BM!). Morogoro District. Nguru Mts, ridge above 'Spirit Lake' at the north source of Chazi River above Chazi Falls, 2000–2100 m, 6°00'S 37°30'E, 4 February 1989, *Pócs & Knox* 89053/AK (BM!); Lushoto District, West Usambara Mts, 5 km east of Mgwashi village on west slope of Gonja Hill, 1600–1700 m, 4° 47'S 38° 33'E, *Pócs & Krog* 88205/R (BM!).

Syrrhopodon gardneri (Hook.) Schwägr., *Sp. musc. frond. suppl.* **2** (1): 110 (1824).
Fig. 2e, f, 3.

Calymperes gardneri Hook. *Musci Exot.* **2**: 146 (1819). Type: Nepal, *Gardner* [1205] (BM!-holotype, BM!-isotype).

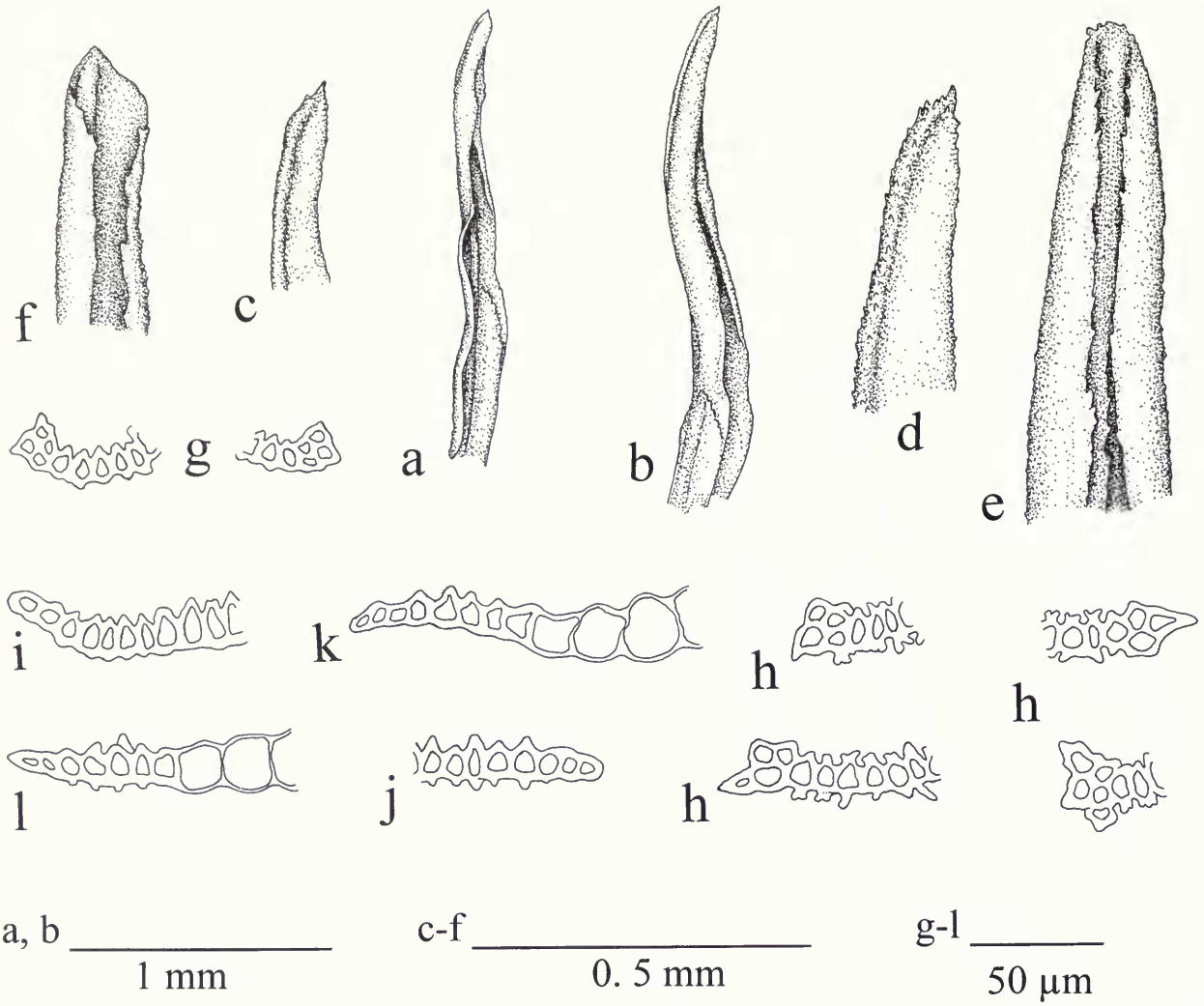

Fig. 3 a–l. *Syrrhopodon gardneri* (Hook.) Schwägr. a–b: leaves; c–f: details of leaf apex, (c, d: in lateral view, e, f: in ventral view); g–l: cross-sections through leaf margin (g, h: in chlorophyllose limb, i, j: around apex of hyaline base, k, l: in distal hyaline base). a, c, f, g, i, k Drawn from *Gardner* H1205 (BM, isotype of *Syrrhopodon gardneri*). b, d, e, h, j, l Drawn from *Lisowski* s.n.(EGR, holotype of *Syrrhopodon lisowskii*).

Syrrhopodon lisowskii S. Orbán in *Egri Ho Si Minh Tanárképzö Föis. Füzetei* **18**: 81 (1987), syn. nov. Type: Zaire, Haut Shaba, Env. de Kasumbalesa, Colline Kibwe I., 1400 m, 20 March 1971, *Lisowski* s.n. (EGR!-holotype).

DISCUSSION. The holotype of *Syrrhopodon lisowskii* S. Orbán possesses narrow, gemma-bearing leaves that have strongly incurved margins. Orbán & Reese (1986) use these features to distinguish *S. lisowskii* from *S. gardneri* (Hook.) Schwägr. However, cross-sections of the leaves from the types of *S. gardneri* and *S. lisowskii* are indistinguishable (Fig. 3–l), and an examination of a large number of specimens has shown that leaves with incurved margins and/or bearing gemmae fit comfortably within the range of features characteristic of *S. gardneri*.

In the latter species, young leaves often tend to possess strongly incurved margins and can have blunt, almost cucullate apices. The isotype material of *Syrrhopodon gardneri* (BM) has many leaves with a lamina approaching the degree of incurvature apparent in *S. lisowskii* (Fig. 3e, f). Gemmae occur in many specimens of *S. gardneri* and their presence is not correlated with the relative breadth of the leaf or incurvature of the leaf margins. They may be produced on the ventral and sometimes dorsal surfaces of the costa, often in a bunch at the leaf apex (Fig. 2e). In a collection from Malawi (*Longton* M8375a) gemmae occur in small groups at intervals along the costa, associated with the loosely transverse rows of prominent costal teeth. The leaves of this specimen are not especially narrow nor are the margins of the chlorophyllose lamina particularly incurved (Fig. 2f). In all respects it is identifiable as *S. gardneri*.

SPECIMENS EXAMINED. **Malawi.** Mulanje Mountain, June 1991: *N. Hodgetts* M2008e, M2026d, M2048b, M2066a, M2067b, 2383a, 2555a, M2638a, 2661a, 2662c (RNG!); *Kathumba* M5058(BM!), M5073b(RNG!); *Kungu* M3241 (BM!), M3267c, M3268a, M3033 (RNG!); *Longton* M8231a, M8232a, M8375a, M8648a (RNG!); *Magombo* M4238a (RNG!); *O'Shea* 7107b, 7108d, 7110a, 7111b, 7138a, 240a, 7240b pro parte, 7241b, M7404c, M7406b, M7508a, M7509b (RNG!), 7318a, 7389a (BM!); *Porley* 98a, 232a, 317a, 329a (RNG!); *Wigginton* M1009b pro parte, M1024b pro parte, M1217a, M1219a, M1225a, M1243a, M1247a, M1417a, M1576a (RNG!). Zomba Plateau, forestry campsite opposite Chawe School, 1470 m, 8 August 1993, *Stevenson* s.n. (BM!). **Uganda**. Ishasha

Gorge, Kanunga, 7500 ft, 6 June 1952, *Lind* 14 (BM!); Bwindi National Park, forest 1 km east of the Zaire border near Rukubira, 1680 m, 0°59'53"S 29°35'50"E, 3 February 1996, *Matcham* U1118a (BM!). **Democratic Republic of Congo**. Lushiji, October 1923, *Overlaet* 347 (BM!). **Angola**. Huilla District, near Humpata, 3800–5500 ft, May 1860, *Welwitsch* 6 (BM!- isotype of *Calymperes welwitschii* Dub.). **Madagascar.** Ankafana, 1880, *Deans Cowan* s.n. (BM!).

Calymperes palisotii Schwägr. *Sp. musc. frond. suppl.* **1** (2): 334 (1816). Type: Nigeria, 'Oware' [Warri], *Palisot de Beauvois* s.n. (BM!- lectotype).
Fig. 2g–j.

DISCUSSION. Orbán (1995) identified three specimens from continental Africa as *Calymperes palisotii* ssp. *moluccense* (Schwägr.) M. Menzel in M. Menzel & Schultze-Motel [=*Calymperes moluccense* Schwägr.]. These specimens, collected by Lisowski from Zaire and Guinea, would have been the first African records for *C. moluccense*. Unfortunately, all three collections are *Calymperes palisotii* Schwägr. (non *C. moluccense*). The cells of the chlorophyllose lamina are ventrally roundly protuberant (Fig. 2i, j) and the lamina at the apex of gemmiferous leaves forms a broad point (Fig. 2g, h). These features are typical of *C. palisotii*, and are especially well represented in collections from Africa. As explained by Ellis (1987) and Ellis & Tan (1999), *C. moluccense* (syn. *C. palisotii* ssp. *moluccense*) is distinguishable from *C. palisotii* by its possession of laminal chlorocysts that are ventrally drawn out as acute, often coronate-papillose projections, and gemmiferous leaves with a rounded rather than broadly pointed apex.

Calymperes moluccense Schwägr. has yet to be found in continental Africa or the adjacent islands of the Indian Ocean, and must still be regarded as an Indo-Pacific species.

SPECIMENS EXAMINED. **Guinea.** Conakry, Campagnie Minière, 23 December 1961, *Lisowski* 918 (EGR!). **Democratic Republic of Congo.** Haut-Zaire, Kisangani: près de la Porte, 11 December 1977, *Lisowski* 50255 (EGR!); centre de la ville, 22 December 1977, *Lisowski* 50379 (EGR!).

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